Research Article

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Racial and ethnic differences in diagnosis, healthcare utilization and 1-year outcomes for patients with significant tricuspid regurgitation

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Background: The impact of race and ethnicity on prognosis and clinical outcomes in patients with significant tricuspid regurgitation (sTR) is not well understood. **Aim:** Describe healthcare utilization trends preceding the development of sTR and assess clinical outcomes 1-year post-sTR status by race and ethnicity. **Materials & methods:** We conducted a retrospective, longitudinal descriptive study using data from a large database containing electronic health record and insurance claims information. We employed multivariate modeling to assess the relationship between 1-year clinical outcomes and mutually exclusive race/ethnicity groups and other baseline factors. **Results:** Black patients were more likely to be identified as having sTR as inpatients when compared with White patients ($p < 0.001$) and had fewer outpatient visits to cardiac specialists before and after developing sTR ($p < 0.01$). Black and Hispanic patients with sTR were at increased risk of heart failure hospitalization compared with White patients at 1 year (adjusted HR: 1.21, 95% CI: 1.16–1.26, $p < 0.001$ and adjusted HR: 1.10, 95% CI: 1.02–1.19, $p < 0.05$ respectively). However, both Black and Hispanic patients had lower 1-year mortality than White patients in the adjusted model. **Conclusion:** Black and Hispanic patients are less likely to have received outpatient care by a cardiac specialist prior to the development of sTR, and have higher rates of heart failure hospitalization after diagnosis. In contrast, their mortality rates following sTR identification are lower than White patients. Further investigation into the underlying mechanisms of these observations is needed to improve TR-related outcomes.

Plain language summary

What is this article about? Tricuspid regurgitation (TR) is a heart valve condition that can progress in terms of symptoms and severity over time. The purpose of this article is to understand if there are differences in healthcare pathways leading up to and clinical outcomes after significant symptoms and severity are present that are related to race and ethnicity.

What methodology was used in this study? This a retrospective observational study. Researchers identified a group of patients with significant TR (sTR) in a real-world database that has information from medical records and insurance claims and examined their demographic and clinical characteristics as well as 1-year health outcomes.

What were the results? Race and ethnicity categories were related to the kind of healthcare patients received leading up to a time point when their TR was identified as significant and to how often patients were hospitalized for heart failure or died in the year after. Before sTR, Black and Hispanic patients received more acute care compared with White patients and White patients received more outpatient cardiac specialist care compared with Black and Hispanic patients. After significant TR, Black and Hispanic patients were at increased risk of heart failure hospitalization compared with White patients, while White patients were at increased risk of death compared with Black and Hispanic patients.

Why are these results important? These results suggest that race and ethnicity may play a role in healthcare experiences and outcomes for people with sTR. The findings highlight differences in care and outcomes, emphasizing the need for healthcare providers and systems to address these differences. Understanding and reducing such differences is important for making sure all patients receive high-quality, equitable care for sTR, ultimately improving health for everyone.

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Keywords: disease progression • electronic health records • healthcare disparities • race and ethnicity • real-world evidence • tricuspid regurgitation • tricuspid valve insufficiency

Tricuspid regurgitation (TR) is a common valve disorder that frequently co-occurs with other valve disease and increases in prevalence with age [1]. Once TR is present, the risk of mortality increases in parallel with progression in its severity [2,3]. Surgical treatment is infrequent and postoperative outcomes remain poor, due to at least in part to the late presentation and surgical management of advanced disease [4,5]. Our understanding of the pathophysiology and clinical outcomes for patients with TR continues to evolve, with recent research highlighting increasing prevalence with age and anatomic differences, higher prevalence, and poorer prognosis for women than for men [5].

The impact of race and ethnicity on prognosis and clinical outcomes in patients with TR is not as well understood. Racial/ethnic disparities in the burden and outcomes of cardiovascular disease, in general, have been studied and are especially pronounced among non-Hispanic Black Americans [6,7]. These disparities have persisted despite decades of research and public policy efforts [8,9], driven by a complex interplay of clinical, social, and structural factors [7,10]. For TR specifically, while a recent study looked at racial/ethnic differences in the clinical course of severe TR within a single healthcare system in New York City, nationwide data remain limited [11].

Given the diverse US population, understanding healthcare use – including timeliness of evaluation and diagnosis – and outcomes across different patient racial and ethnic groups holds important clinical and health policy implications. Accordingly, we conducted a descriptive analysis of real-world patterns of healthcare utilization and cost for patients developing significant TR (sTR) across the US. In that study [12], we observed a high intensity of care for sTR across all demographic groups, with increased risk of hospitalization in the post-sTR period for Black and Hispanic patients. The current analysis examines clinical outcomes in the year after sTR status by race and ethnicity in greater depth, with adjustment for baseline covariates.

Materials & methods

This study is a retrospective, longitudinal cohort study using patient records from linked claims and electronic health record (EHR) data to identify and follow sTR patients.

Data source

This study used Optum's de-identified Market Clarity Data (years 2007–2023). The data source is one of the largest repositories of longitudinal data from real-world patients in the US, containing medical and pharmacy claims from a large national payer and additional third-party payers, linked with clinical data from EHRs [13]. Patient data used to perform this analysis were de-identified and accessed in compliance with the Health Insurance Portability and Accountability Act. Institutional review board approval was not required for this study due to its retrospective, observational and anonymized nature. To categorize patients' race and ethnicity, Market Clarity incorporates patient self-reported values as captured in the EHR.

Patient selection

The analysis was conducted in a population of adults aged 50 years and above with TR who developed sTR between January 2018 and December 2023. As in the related analysis [12], sTR was defined by criteria generated in consultation with expert physicians; patients with either severe, massive or torrential TR in physician notes, or a TR diagnosis (International Classification of Diseases, 10th revision [ICD-10]: I36.1 non-rheumatic tricuspid valve insufficiency) and subsequent development of at least three of seven conditions – ascites, edema, liver disease, chronic kidney disease, extreme fatigue, weight loss and/or right ventricular dysfunction were classified as having sTR. Continuous health plan enrollment was required for the 12 months prior to patients meeting the definition of sTR (year -1) to give adequate time to capture comorbidities and TR-related symptoms. For year -2 and year -3,

patients were included if they had continuous enrollment for the full year. Patients were also required to be alive and enrolled for at least 1 day after meeting criteria for sTR. Patients with missing race or ethnicity information, or those from categories with very low counts in the database (e.g., Asian) were excluded from the analysis.

Patient characteristics

Patients were grouped by race and ethnicity using three mutually exclusive categories: Hispanic (regardless of concurrent race category), White non-Hispanic and Black non-Hispanic. Baseline characteristics were assessed at the time of meeting the sTR definition. Comorbidities were captured using ICD-10 codes as previously described [12]. To give an assessment of overall comorbidity burden, the Elixhauser comorbidity index was computed according to established procedures [14]. Inpatient status at the time of sTR identification was also captured.

Outcomes

The primary outcomes were all-cause death and heart failure hospitalization during the year after identification of sTR. Mortality data are captured from EHR and claims data sources and supplemented with external data sources including the Social Security Death Master File, Centers for Medicare and Medicaid services data and obituaries. Linkages to external mortality data are incorporated into the patient record by the database provider for high degree of confidence matches. In addition to the two main outcomes, we examined measures of healthcare utilization both 3 years before and 1 year after sTR: urgent or emergent hospital admissions, emergency department visits and outpatient cardiac specialist visits.

Statistical analysis

Black and Hispanic patient groups were compared with the White group on all baseline characteristics using t-tests for continuous variables and chi-square tests for categorical variables. Categorical variables are reported as counts and percentages and continuous variables as means and standard deviations (SD). Survival analysis curves were calculated for 1-year all-cause death (Kaplan–Meier) and heart failure hospitalization (cumulative incidence function for a competing risk of death). Unadjusted and adjusted hazard ratios comparing Black and Hispanic to White patients were calculated for all 1-year events with hazard models (Cox proportional or Fine–Gray subdistribution, as appropriate). Model adjustment included all baseline characteristics included in Table 1. Finally, baseline characteristics were examined as explanatory variables for all-cause death and heart failure hospitalization using Cox proportional and Fine–Gray subdistribution hazard models respectively. Eight explanatory variable models were run – four each for all-cause death and heart failure hospitalization (overall, White, Black, Hispanic). Values of p less than 0.05 were considered significant. All statistics were calculated in R.

Results

In total, 72,630 patients met all inclusion and exclusion criteria for this study at the time they reached sTR status (Figure 1 for attrition details). The vast majority of patients met sTR criteria due to concomitant comorbid conditions such as chronic kidney disease, liver disease and edema following a previous TR diagnosis – the number of patients meeting sTR criteria with a physician's note indicating severe or torrential TR was small (less than 2% for all race/ethnicity groups; Supplementary Table 1).

Baseline characteristics

Across race/ethnicity groups, the majority of patients were White (79.8%), female (54.4%), Medicare beneficiaries (70%) and from the Midwest (53.7%). Mean patient age was 72.5 years (SD 10.5 years), and mean Elixhauser comorbidity score was 9.5 (SD 3.9). Comorbidity burden increased over time, both in the years prior to the development of sTR and the year after (Supplementary Table 2).

Table 1 displays baseline characteristics by race/ethnicity category. Black and Hispanic patients were younger on average than White patients. Black and Hispanic patients had higher rates of diabetes and kidney disease, while White patients had higher rates of atrial fibrillation and valve diseases other than TR.

Healthcare utilization & TR diagnosis prior to meeting sTR criteria

Over half (56.8%) of patients had a TR diagnosis 3 years prior to developing sTR. Black patients were less likely to have a prior diagnosis of TR when compared with White ($p < 0.001$) and Hispanic ($p < 0.001$) patients. Black

Table 1. Patient characteristics at baseline, by race/ethnicity.

	White	Black†	Hispanic†
n	57,960	11,950	2720
Age, mean (SD)	73.2 (10.3)	**69.5 (10.6)**	**70.0 (10.8)**
Sex-Female, n (%)	30,722 (53.0)	**7318 (61.2)**	1494 (54.9)
Census region, n (%)			
Midwest	32,586 (56.2)	**5685 (47.6)**	**719 (26.4)**
South	12,478 (21.5)	**3194 (26.7)**	**940 (34.6)**
Northeast	9563 (16.5)	**2770 (23.2)**	**760 (27.9)**
West	3333 (5.8)	**302 (2.5)**	**301 (11.1)**
Payor, n (%)			
Medicare	41,458 (71.5)	**7630 (63.8)**	**1721 (63.3)**
Commercial	13,760 (23.7)	**2575 (21.5)**	**625 (23.0)**
Medicaid	2742 (4.7)	**1745 (14.6)**	**374 (13.8)**
Elixhauser score, mean (SD)	9.3 (3.8)	**10.2 (4.0)**	**9.8 (4.0)**
Comorbidities, n (%)			
Atrial fibrillation	31,901 (55.0)	**4796 (40.1)**	**1168 (42.9)**
Other valve disease	49,436 (85.3)	**9575 (80.1)**	**2185 (80.3)**
Coronary artery disease	40,377 (69.7)	**8070 (67.5)**	1877 (69.0)
Peripheral artery disease	35,821 (61.8)	**7700 (64.4)**	**1836 (67.5)**
Congestive heart failure	37,966 (65.5)	**8454 (70.7)**	1794 (66.0)
Hypertension	56,073 (96.7)	**11,795 (98.7)**	2650 (97.4)
Pulmonary hypertension	19,074 (32.9)	**4479 (37.5)**	**823 (30.3)**
Liver disease	54,184 (93.5)	**11,052 (92.5)**	2563 (94.2)
Kidney disease	32,420 (55.9)	**7903 (66.1)**	**1675 (61.6)**
CKD 5 or ESRD	3095 (5.3)	**1577 (13.2)**	**339 (12.5)**
Diabetes	31,606 (54.5)	**8452 (70.7)**	**2021 (74.3)**
Stroke or TIA	20,181 (34.8)	**4770 (39.9)**	**1023 (37.6)**
Dementia	8419 (14.5)	**2013 (16.8)**	**458 (16.8)**
Cancer	6394 (11.0)	1278 (10.7)	**225 (8.3)**
COPD	27,734 (47.9)	**5934 (49.7)**	**1145 (42.1)**
Other			
Prior valve intervention (non-tricuspid), n (%)	3390 (5.8)	**272 (2.3)**	**114 (4.2)**
Pacemaker, n (%)	2798 (4.8)	**388 (3.2)**	112 (4.1)
Oxygen dependence, n (%)	8543 (14.7)	1750 (14.6)	**349 (12.8)**
Inpatient at time of sTR, n (%)	28,002 (48.3)	**6578 (55.0)**	1312 (48.2)
OP cardiac specialist visits in year prior to sTR, M (SD)	3.35 (4.42)	**2.66 (3.98)**	**2.84 (4.03)**

†Bold values are significantly different from values for White patients at $p < 0.05$.
CKD 5: Chronic kidney disease stage 5; COPD: Chronic obstructive pulmonary disease; ESRD: End-stage renal disease; OP: Outpatient; SD: Standard deviation; sTR: Significant tricuspid regurgitation; TIA: Transient ischemic attack.

patients reached sTR status during inpatient admissions significantly more often than White patients (55 vs 48.3%, $p < 0.001$), but Hispanic patients (48.2%) did not differ significantly from White patients ($p = 0.95$).

Black patients had more urgent/emergent admissions and emergency department visits than White patients for all 3 years prior (year -3, year -2 and year -1) to the development of sTR (Figure 2). Black patients also had more urgent/emergent admissions than Hispanic patients for all prior years, and more emergency department visits in year -2 and year -1. Hispanic patients had more emergency department visits than White patients for all three prior years, but only differed on urgent/emergent admissions in year -1. White patients had more outpatient cardiac specialist visits than Black and Hispanic patients for all years prior to developing sTR. Hispanic patients also had more outpatient cardiac specialist visits than Black patients in year -3 but not in year -2 or year -1.

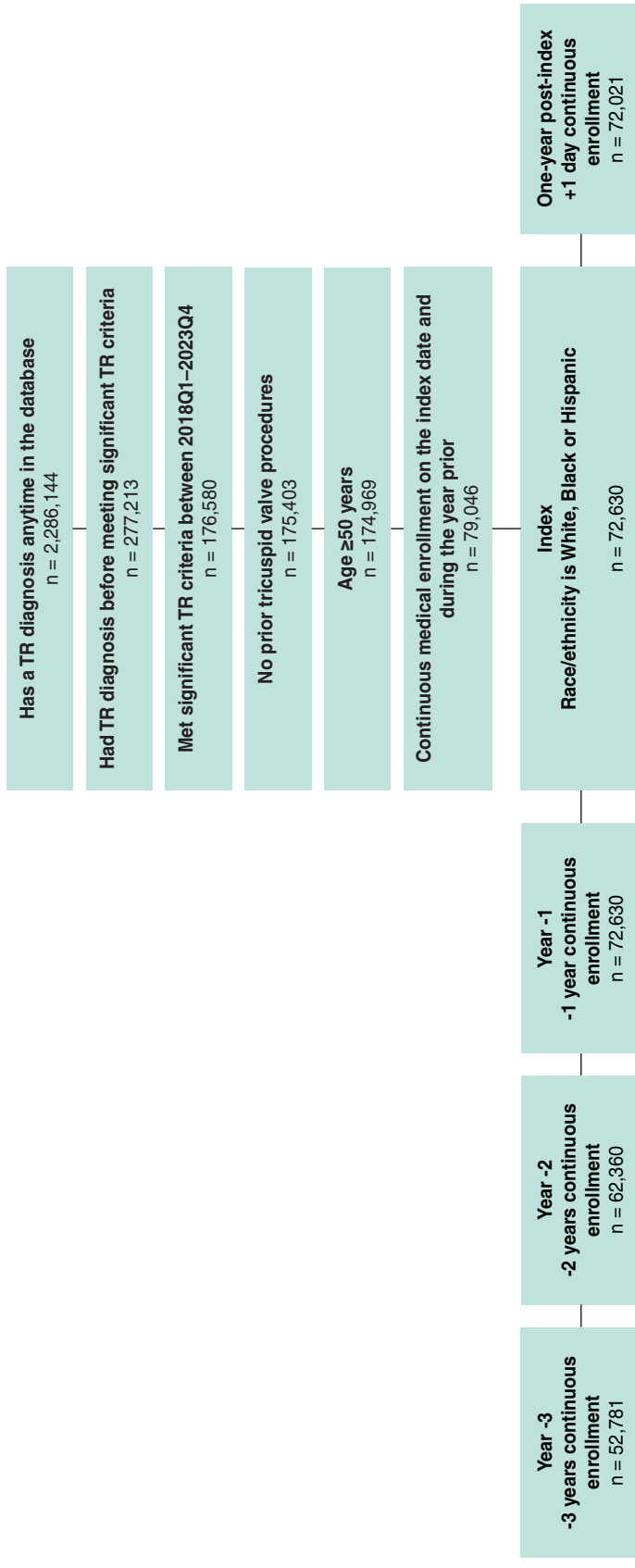

Figure 1. Cohort attrition.
n: Number of patients; TR: Tricuspid regurgitation.

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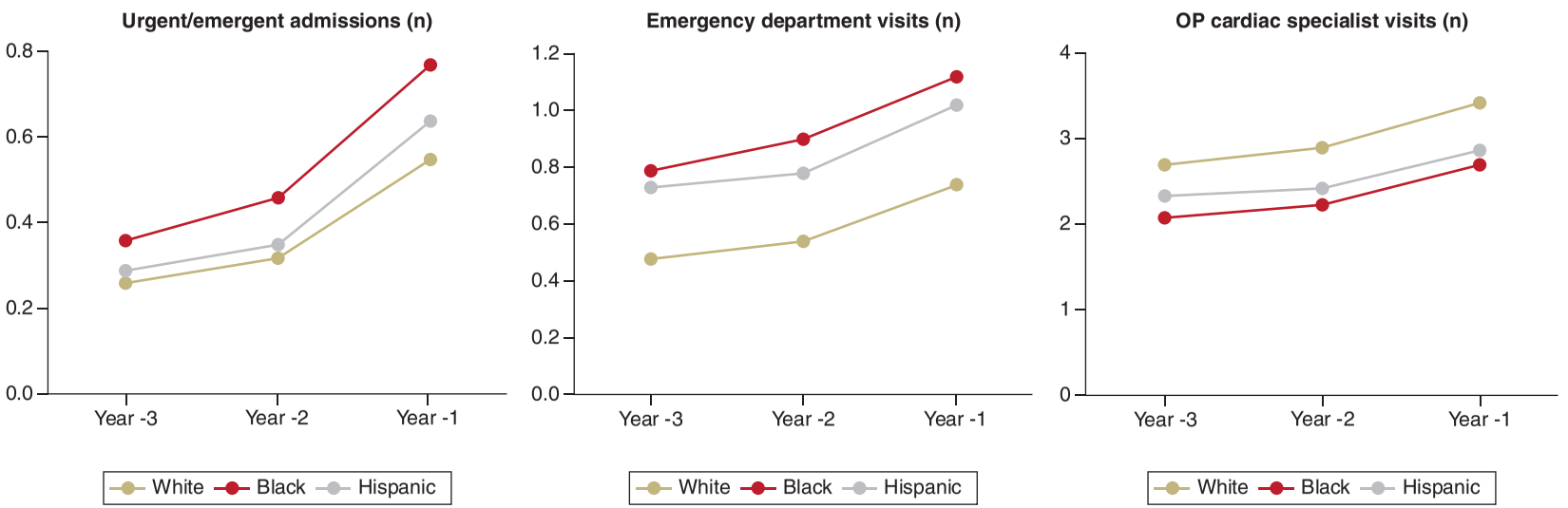

- ANOVA significant in all time periods ($p < 0.01$)

Tukey's test results:

- In year -3 and year -2, the Black group differed from the other two ($p < 0.05$).
- In year -1 all three groups differed from each other ($p < 0.05$).

- ANOVA significant in all time periods ($p < 0.01$)

Tukey's test results:

- In year -3, the White group differed from the other two ($p < 0.05$).
- In year -2 and year -1 all three groups differed from each other ($p < 0.05$).

- ANOVA significant in all time periods ($p < 0.01$)

Tukey's test results:

- In year -3 all three groups differed from each other ($p < 0.05$).
- In year -2 and year -1 the White group differed from the other two ($p < 0.05$).

Figure 2. Healthcare utilization measures before significant tricuspid regurgitation, by race/ethnicity.
OP: Outpatient.

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Table 2. Adjusted hazard ratios for 1-year post-significant tricuspid regurgitation events, by race/ethnicity.

1-year measures	Black			Hispanic		
	HR[†]	(95% CI)	p-value	HR[†]	(95% CI)	p-value
Time to death (all-cause)[‡]	0.84	(0.80, 0.88)	<0.001	0.86	(0.78, 0.95)	<0.01
Time to heart failure hospitalization[§]	1.21	(1.16, 1.26)	<0.001	1.10	(1.02, 1.19)	0.014
Time to urgent/emergent admission[§]	1.15	(1.11, 1.19)	<0.001	0.97	(0.91, 1.05)	0.49
Time to emergency department visit[§]	1.16	(1.12, 1.20)	<0.001	1.13	(1.05, 1.20)	<0.001
Time to outpatient cardiac specialist visit[§]	0.96	(0.93, 0.99)	<0.01	1.03	(0.97, 1.08)	0.34

[†]Hazard ratios are adjusted for all baseline characteristics in Table 1, with White patients as the reference group.
[‡]Calculated using Cox proportional hazards models.
[§]Calculated using Fine–Gray subdistribution hazard models.
CI: Confidence interval; HR: Hazard ratio.

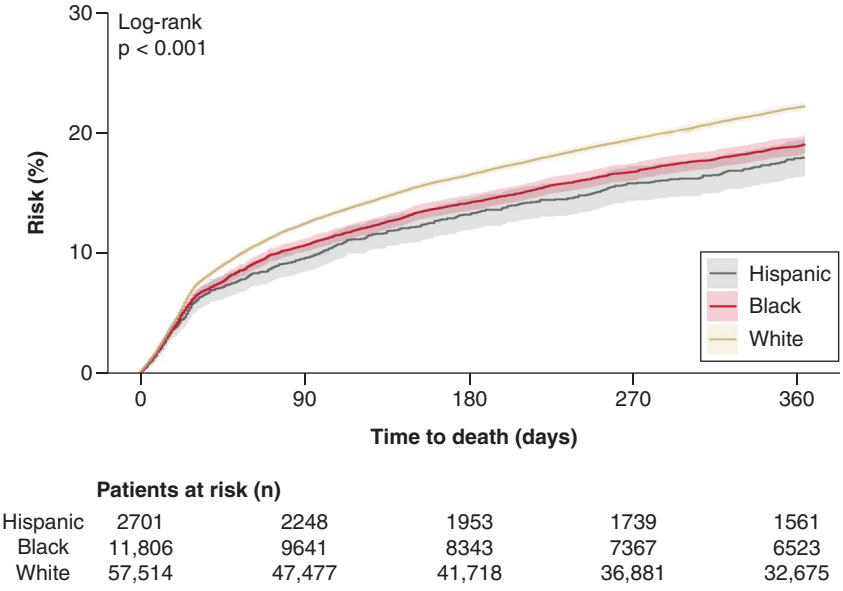


Figure 3. All-cause mortality risk in the year after significant tricuspid regurgitation, by race/ethnicity.

Healthcare utilization & health outcomes 1-year post-sTR

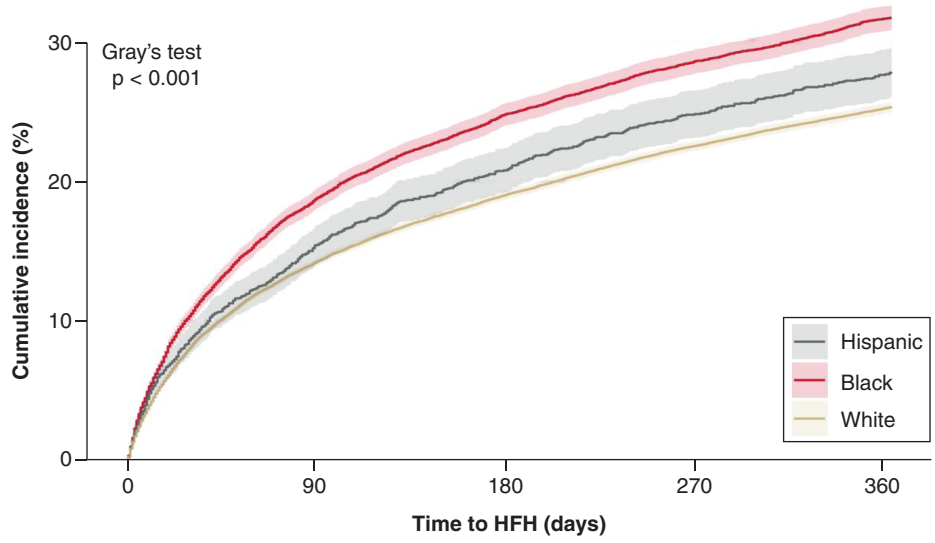
Table 2 shows the adjusted hazard ratios (HRs) for healthcare utilization measures 1-year after the development of sTR. Trends were similar to those seen prior to meeting sTR criteria. After adjustment, Black patients had higher rates of urgent/emergent admissions ($p < 0.001$) and emergency department visits ($p < 0.001$) but fewer cardiac specialist visits ($p < 0.01$) compared with White patients. Hispanic patients did not differ from White patients for urgent/emergent admissions or outpatient cardiac specialist visits, but did have higher rates of emergency department visits ($p < 0.001$). See Supplementary Table 3 for unadjusted hazard ratios.

Figure 3 displays the Kaplan–Meier curve for death in the year after development of sTR by race/ethnicity. After adjustment for baseline characteristics (Table 1), Black and Hispanic patients both had a lower risk of death compared with White patients ($p < 0.001$ and $p < 0.01$ respectively; Table 2).

Figure 4 displays the cumulative incidence function for heart failure hospitalization in the year after development of sTR by race/ethnicity. After adjustment for baseline characteristics (Table 1), Black and Hispanic patients both had a greater risk of heart failure hospitalization compared with White patients ($p < 0.001$ and $p < 0.05$ respectively; Table 2).

Explanatory variables

Figure 5 displays the HRs for potential explanatory variables for death (all baseline characteristics from Table 1), both overall and for each race/ethnicity category. Inpatient status at the time of meeting sTR criteria was the



Patients at risk (n)

Hispanic	2701	1916	1581	1348	1171
Black	11,806	7897	6398	5449	4650
White	57,514	41,155	34,533	29,505	25,495

Figure 4. Heart failure hospitalization cumulative incidence in the year after significant tricuspid regurgitation, by race/ethnicity.
HFH: Heart failure hospitalization.

strongest predictor of death overall (HR: 2.39, 95% CI: 2.29–2.48, p < 0.001) and for each race/ethnicity category (Supplementary Table 4).

Figure 6 displays the HRs for the potential explanatory variables for heart failure hospitalization both overall and for each race/ethnicity category. Pre-existing congestive heart failure at baseline was the strongest predictor of heart failure hospitalization for all groups (HR: 3.60, 95% CI: 3.41–3.81; Supplementary Table 5).

Overall, older age, male sex, higher Elixhauser score, atrial fibrillation, congestive heart failure, pulmonary hypertension, kidney disease, oxygen dependence and identification of sTR during an inpatient encounter were all associated with greater risk of death and heart failure hospitalization. Receiving prior intervention on other (i.e., non-tricuspid) valves was associated with lower hazard ratios for both death and heart failure hospitalization. Diabetes and a prior pacemaker were both associated with lower risk of death only. Peripheral artery disease, stage 5 chronic kidney disease and chronic obstructive pulmonary disease were associated with higher risk of heart failure hospitalization only. Medicaid enrollment, other valve diseases, coronary artery disease, hypertension and outpatient cardiac specialist visits in the year prior to sTR were all associated with lower risk of death but higher risk of heart failure hospitalization. Stroke and cancer were associated with higher risk of death and lower risk of heart failure hospitalization. Some associations such as census region, hypertension and diabetes varied by race/ethnicity (Supplemental Tables 4 & 5).

Discussion

This contemporary nationwide analysis of 72,630 patients who developed sTR between 2018 and 2023 provides critical insights into the current landscape of the progression and clinical manifestation of TR among different racial and ethnic patient groups. Compared with White patients, Black patients were less likely to have a preexisting TR diagnosis and were most often in an inpatient setting when they met sTR criteria. Prior to developing sTR, Black and Hispanic patients had higher rates of acute care utilization but fewer outpatient cardiac specialist visits, with consistent trends in the year following sTR status. One-year clinical outcomes revealed significant but contrasting patterns: Black and Hispanic patients had a higher risk of heart failure hospitalization, whereas White patients faced a greater risk of death even after adjustment for age and baseline clinical characteristics. Baseline characteristics and clinical comorbidities were associated with adverse outcomes. Inpatient admission at the time of meeting sTR criteria emerged as a strong predictor of subsequent death.

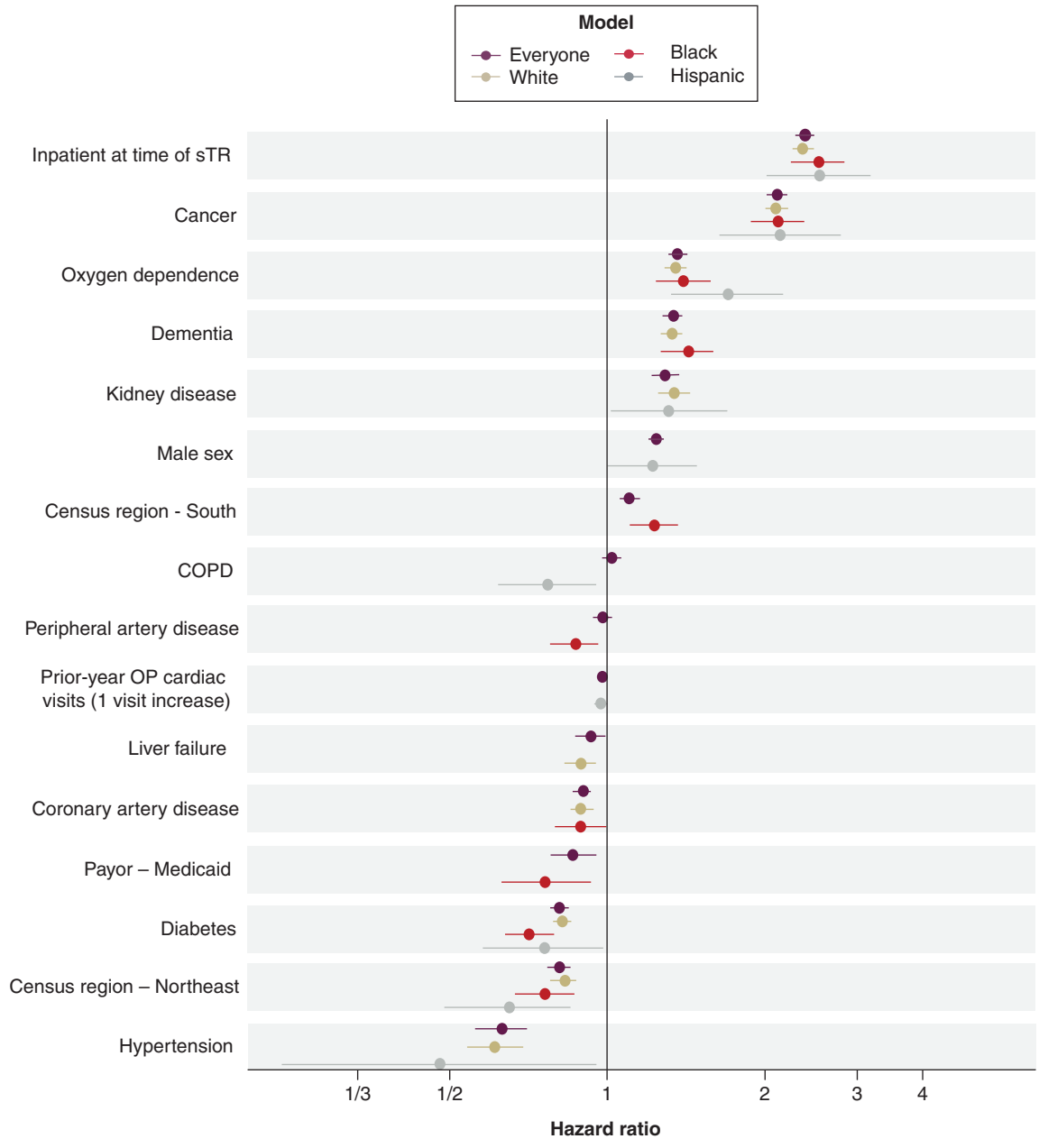


Figure 5. Hazard ratios for all-cause mortality explanatory variables* in the year after significant tricuspid regurgitation.
*Variables included in the figure represent the five strongest, statistically significant explanatory variables with increased risk and the five strongest, statistically significant explanatory variables with decreased risk for each race/ethnicity category.
CHF: Congestive heart failure; CKD 5: Chronic kidney disease stage 5; COPD: Chronic obstructive pulmonary disease; ESRD: End-stage renal disease; OP: Outpatient; TIA: Transient ischemic attack.

In one prior study of patients with severe TR who were included in the Bronx-Valve registry (n = 989), results showed that Black and Hispanic patients presented with more advanced disease and higher comorbidity burdens compared with White patients, despite their younger age [11]. In addition, Black patients experienced a significantly higher risk of heart failure hospitalization [11]. Our study confirms these findings in a large national dataset, and offers insight into the influence of race and ethnicity on the clinical trajectories of patients who develop sTR. However, that study also found that 5-year mortality rates were not significantly different across racial and ethnic groups, a finding in contrast with the increased 1-year risk of death for White patients in the current study as well

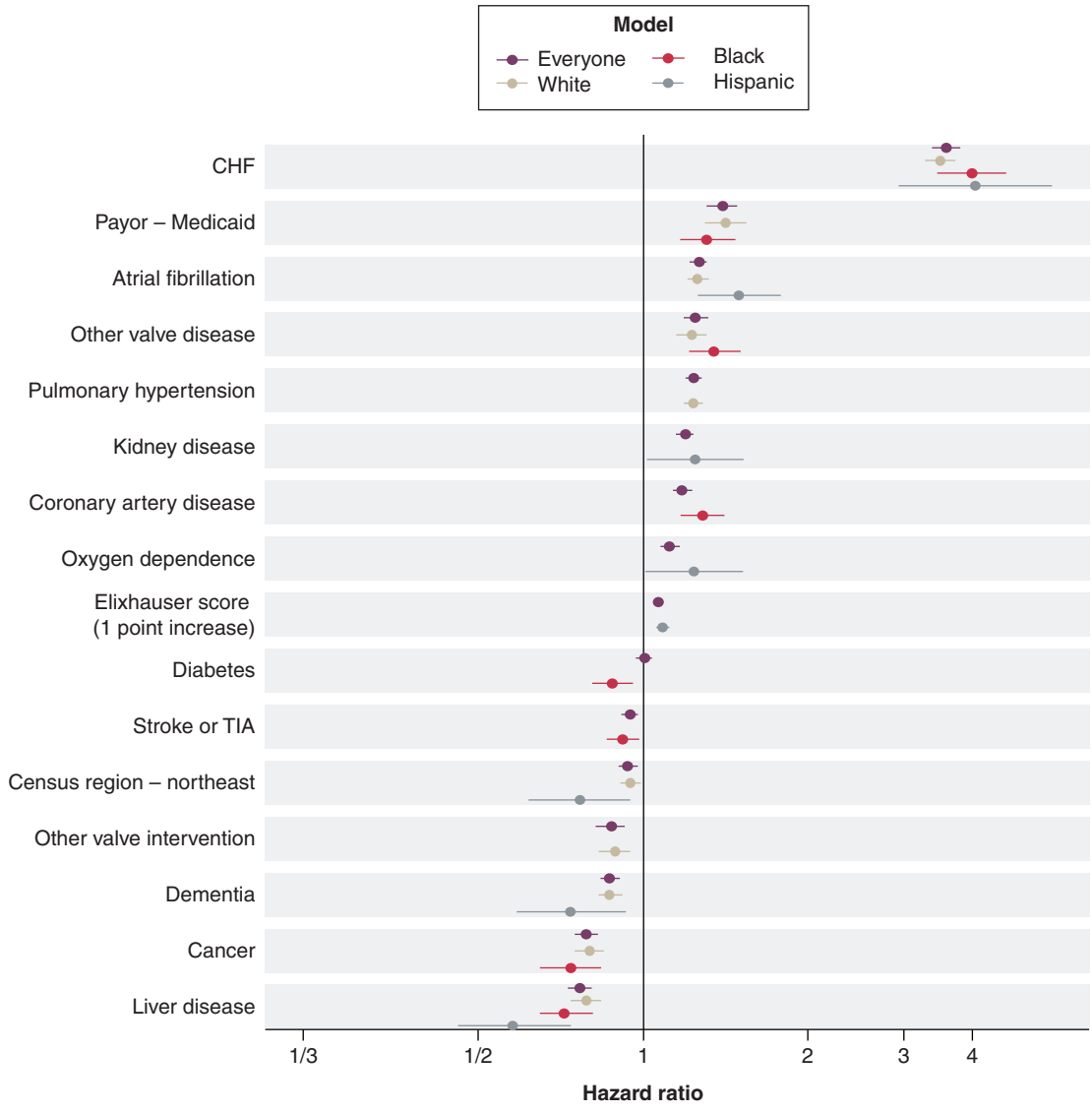


Figure 6. Hazard ratios for heart failure hospitalization explanatory variables* in the year after significant tricuspid regurgitation.
*Variables included in the figure represent the five strongest, statistically significant explanatory variables with increased risk and the five strongest, statistically significant explanatory variables with decreased risk for each race/ethnicity category.
CHF: Congestive heart failure; CKD 5: Chronic kidney disease stage 5; COPD: Chronic obstructive pulmonary disease; ESRD: End-stage renal disease; OP: Outpatient; TIA: Transient ischemic attack.

as a recent analysis of death certificate data that found higher tricuspid valve disorder-related mortality rates in White and American Indian populations than in Black populations [15]. Several important differences between the studies, including the clinical specificity and number of variables in the models, sample size, and sample definition (i.e., severe vs significant TR), are likely related to this variation in outcomes.

The paradox of lower mortality but higher hospitalization among Black patients has been seen in several studies of heart failure, a highly prevalent comorbid condition in our analysis. In a study of Medicare heart failure patients (n = 47,149), Black adults had higher rates of cardiovascular-related readmission but lower mortality at 30-days and 1-year after risk adjustment; Hispanic adults also had higher readmission rates, but comparable 1-year mortality to White patients [16]. In another real-world heart failure cohort (n = 34,621), Black patients had a higher rate of heart failure hospitalization but lower rate of death compared with White patients. The adjusted effect estimates for heart failure hospitalization (HR: 1.28, 95% CI: 1.18–1.38) and all-cause death

(HR: 0.78, 95% CI: 0.72–0.8) were consistent with those observed in our analysis [17]. The elevated risk of hospitalization among Black patients may reflect unmeasured confounding variables such as differences in disease burden, patient–provider treatment dynamics, thresholds for inpatient admission, access to outpatient services, medication adherence and broader socioeconomic factors [17–19]. Similarly, the higher mortality observed in White patients may point to potential variations in confounding variables such as TR pathophysiology and limitations of current management strategies [17,18]. Notably, Medicaid enrollment was similarly associated with a higher risk of heart failure hospitalization but lower mortality in our analysis, highlighting the potential influence of insurance and healthcare delivery models on clinical outcomes [20].

A prior analysis of the Optum database did examine the impact of TR and race on mortality rates in heart failure patients [21]. Models comparing patients with severe TR to patients without TR showed an overall increased risk of 2-year mortality that varied in size between non-White (52%) and White (33%) patients; however, non-White and White patients were not compared directly. Thus, the current results fill a gap in reporting of differences between specific racial and ethnic subgroups among patients with sTR. Further investigation of confounding variables beyond the scope of the current study will be necessary to elucidate the mechanisms underlying these racial and ethnic differences in TR clinical outcomes.

In addition to ensuring timely detection of TR, effort should also be directed toward more inclusive outpatient care. Among Black and Hispanic patients, fewer follow-up visits with a cardiologist after meeting sTR criteria may reflect barriers to specialist care for non-White patients. Without regular outpatient specialty care, cardiovascular related adverse events that necessitate emergency department visits and unplanned hospitalizations may become more frequent [18]. Studies have shown that minority patient groups have lower rates of specialty provider follow-up compared with White patients [22]. To bridge these gaps, improving care delivery models will be necessary to attenuate these differences, particularly in vulnerable communities with fragmented healthcare infrastructures.

Overall, improvement in outcomes will heavily rely on early TR recognition by clinicians and referral to comprehensive valve centers with multidisciplinary expertise [23]. Management strategies for TR remain heterogeneous, with surgical or procedural intervention for isolated TR still infrequently performed [5,24,25]. The emergence of transcatheter tricuspid valve interventions is expanding therapeutic options, particularly for patients with high surgical-risk [26]. However, surgical and percutaneous treatment selection is often influenced by multiple factors including race, as Black patients have been reported to be less likely to receive any TR intervention compared with White patients [27]. As the clinical interest in TR continues to grow [28], tailored and patient-oriented strategies to ensure equitable distribution of care are needed [29].

Limitations

Our study utilized a large database that included a diverse payer mix, including commercial insurance, Medicaid and Medicare throughout the US The data source incorporated EHR data and physician notes as well as administrative claims, allowing for longitudinal analysis of TR progression and healthcare utilization. Despite these strengths, the findings from this analysis should be interpreted with the following limitations in mind. First, this was an observational study. Proxy definitions for clinical symptomatology were used to define our sTR population and only a small percentage of patients entered the cohort directly from a physician note of severe or greater TR, a point in contrast to prior literature where severity was known. Granular clinical details are missing from our analysis, including patient baseline laboratory results and echocardiographic parameters such as left ventricular ejection fraction, and severity ratings are not well populated in the physician notes. In addition, the cohort was restricted to patients with non-rheumatic TR, and TR etiology was not captured. Due to limitations in the data, concomitant medical therapy was not assessed nor were other important potential confounding variables, including lifestyle factors such as diet and exercise or socioeconomic characteristics aside from health insurance payor (which may be considered at best a proxy for socioeconomic status). Clustering of patients at the hospital level was not adjusted for in associations between race/ethnicity and outcomes. Finally, race and ethnicity categories were simplified to ensure mutually exclusive groups for analysis; if patients identified as Black or White and also identified as Hispanic, they were classified as Hispanic within the cohort.

Conclusion

Among adults with sTR in the US, we observed racial and ethnic differences in disease recognition, healthcare use and clinical outcomes that expand on prior findings from studies of patients with severe TR or heart failure. Black

and Hispanic patients with sTR were at increased risk of heart failure hospitalization compared with White patients. Black patients used more acute healthcare services, received fewer outpatient cardiology services and more often met sTR criteria in an inpatient setting. White patients had higher rates of mortality at 1 year. Further investigation into the underlying mechanisms of these observations, including measurement of important additional confounding factors, is needed to better improve TR-related outcomes.

Summary points

- Tricuspid regurgitation (TR) progresses over time, causing patients to seek healthcare more often and putting them at risk of being hospitalized for heart failure or dying.
- The results of this study showed that patients from different race and ethnicity categories had different types of healthcare leading up to significant illness and different outcomes in the year after significant illness.
- Black and Hispanic patients more often used acute care resources leading up to significant TR and were more at risk of heart failure hospitalization after, compared with White patients.
- White patients more often used outpatient cardiac specialist care leading up to significant TR and were more at risk of death after, compared with Black and Hispanic patients.
- Understanding how the healthcare pathway and clinical outcomes of patients with progressive conditions like TR vary by characteristics such as race is an important step in improving healthcare quality and equity.

Supplementary data

To view the supplementary data that accompany this paper please visit the journal website at: https://becarispublishing.com/doi/epdf/10.57264/cer-2025-0156

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Competing interests disclosure

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Ethical conduct of research

The authors state that they have obtained appropriate institutional review board approval or have followed the principles outlined in the Declaration of Helsinki for all human or animal experimental investigations. In addition, for investigations involving human subjects, informed consent has been obtained from the participants involved.

Data sharing statement

The authors certify that this manuscript reports the secondary analysis of clinical data that have been shared with them, and that the use of this shared data is in accordance with the terms (if any) agreed upon their receipt.

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